SEQUENCE LISTING

<110> Health Protection Agency

Sutton, John Mark

Raven, Neil David Hammond

<120> Biological Indicator

<130> P26205WO-MRM

<150> GB 0406427.5

<151> 2004-03-22

<160> 30

<170> PatentIn version 3.1

<210> 1

<211> 195

<212> PRT

<213> Sulfolobus solfataricus

<400> 1

Met Lys Ile Gly Ile Val Thr Gly Ile Pro Gly Val Gly Lys Thr Thr
1 5 10 15

Val Leu Ser Phe Ala Asp Lys Ile Leu Thr Glu Lys Gly Ile Ser His
20 25 30

Lys Ile Val Asn Tyr Gly Asp Tyr Met Leu Asn Thr Ala Leu Lys Glu
35 40 45

Gly Tyr Val Lys Ser Arg Asp Glu Ile Arg Lys Leu Gln Ile Glu Lys
50 55 60

```
Gln Arg Glu Leu Gln Ala Leu Ala Ala Arg Arg Ile Val Glu Asp Leu
65                  70                  75                  80

Ser Leu Leu Gly Asp Glu Gly Ile Gly Leu Ile Asp Thr His Ala Val
                85                  90                  95

Ile Arg Thr Pro Ala Gly Tyr Leu Pro Gly Leu Pro Arg His Val Ile
            100                 105                 110

Glu Val Leu Ser Pro Lys Val Ile Phe Leu Leu Glu Ala Asp Pro Lys
        115                 120                 125

Ile Ile Leu Glu Arg Gln Lys Arg Asp Ser Ser Arg Ala Arg Thr Asp
    130                 135                 140

Tyr Ser Asp Thr Ala Val Ile Asn Glu Val Ile Gln Phe Ala Arg Tyr
145                 150                 155                 160

Ser Ala Met Ala Ser Ala Val Leu Val Gly Ala Ser Val Lys Val Val
                165                 170                 175

Val Asn Gln Glu Gly Asp Pro Ser Ile Ala Ala Ser Glu Ile Ile Asn
            180                 185                 190

Ser Leu Met
        195
```

<210> 2

<211> 194

<212> PRT

<213> Sulfolobus acidocaldarius

<400> 2

```
Met Lys Ile Gly Ile Val Thr Gly Ile Pro Gly Val Gly Lys Ser Thr
1               5                   10                  15

Val Leu Ala Lys Val Lys Glu Ile Leu Asp Asn Gln Gly Ile Asn Asn
            20                  25                  30

Lys Ile Ile Asn Tyr Gly Asp Phe Met Leu Ala Thr Ala Leu Lys Leu
        35                  40                  45
```

Gly Tyr Ala Lys Asp Arg Asp Glu Met Arg Lys Leu Ser Val Glu Lys
50 55 60

Gln Lys Lys Leu Gln Ile Asp Ala Ala Lys Gly Ile Ala Glu Glu Ala
65 70 75 80

Arg Ala Gly Gly Glu Gly Tyr Leu Phe Ile Asp Thr His Ala Val Ile
85 90 95

Arg Thr Pro Ser Gly Tyr Leu Pro Gly Leu Pro Ser Tyr Val Ile Thr
100 105 110

Glu Ile Asn Pro Ser Val Ile Phe Leu Leu Glu Ala Asp Pro Lys Ile
115 120 125

Ile Leu Ser Arg Gln Lys Arg Asp Thr Thr Arg Asn Arg Asn Asp Tyr
130 135 140

Ser Asp Glu Ser Val Ile Leu Glu Thr Ile Asn Phe Ala Arg Tyr Ala
145 150 155 160

Ala Thr Ala Ser Ala Val Leu Ala Gly Ser Thr Val Lys Val Ile Val
165 170 175

Asn Val Glu Gly Asp Pro Ser Ile Ala Ala Asn Glu Ile Ile Arg Ser
180 185 190

Met Lys

<210> 3

<211> 197

<212> PRT

<213> Sulfolobus tokodaii

<400> 3

Met Ser Lys Met Lys Ile Gly Ile Val Thr Gly Ile Pro Gly Val Gly
1 5 10 15

Lys Thr Thr Val Leu Ser Lys Val Lys Glu Ile Leu Glu Glu Lys Lys
20 25 30

```
Ile Asn Asn Lys Ile Val Asn Tyr Gly Asp Tyr Met Leu Met Thr Ala
        35                  40                  45

Met Lys Leu Gly Tyr Val Asn Asn Arg Asp Glu Met Arg Lys Leu Pro
    50                  55                  60

Val Glu Lys Gln Lys Gln Leu Gln Ile Glu Ala Ala Arg Gly Ile Ala
65                  70                  75                  80

Asn Glu Ala Lys Glu Gly Gly Asp Gly Leu Leu Phe Ile Asp Thr His
                85                  90                  95

Ala Val Ile Arg Thr Pro Ser Gly Tyr Leu Pro Gly Leu Pro Lys Tyr
            100                 105                 110

Val Ile Glu Glu Ile Asn Pro Arg Val Ile Phe Leu Leu Glu Ala Asp
        115                 120                 125

Pro Lys Val Ile Leu Asp Arg Gln Lys Arg Asp Thr Ser Arg Ser Arg
    130                 135                 140

Ser Asp Tyr Ser Asp Glu Arg Ile Ile Ser Glu Thr Ile Asn Phe Ala
145                 150                 155                 160

Arg Tyr Ala Ala Met Ala Ser Ala Val Leu Val Gly Ala Thr Val Lys
                165                 170                 175

Ile Val Ile Asn Val Glu Gly Asp Pro Ala Val Ala Ala Asn Glu Ile
            180                 185                 190

Ile Asn Ser Met Leu
        195
```

<210> 4

<211> 196

<212> PRT

<213> Pyrococcus furiosus

<400> 4

```
Met Pro Phe Val Val Ile Ile Thr Gly Ile Pro Gly Val Gly Lys Ser
1               5                   10                  15
```

```
Thr Ile Thr Arg Leu Ala Leu Gln Arg Thr Lys Ala Lys Phe Arg Leu
            20                  25                  30

Ile Asn Phe Gly Asp Leu Met Phe Glu Glu Ala Val Lys Ala Gly Leu
        35                  40                  45

Val Lys His Arg Asp Glu Met Arg Lys Leu Pro Leu Lys Ile Gln Arg
    50                  55                  60

Glu Leu Gln Met Lys Ala Ala Lys Lys Ile Thr Glu Met Ala Lys Glu
65                  70                  75                  80

His Pro Ile Leu Val Asp Thr His Ala Thr Ile Lys Thr Pro His Gly
                85                  90                  95

Tyr Met Leu Gly Leu Pro Tyr Glu Val Val Lys Thr Leu Asn Pro Asn
            100                 105                 110

Phe Ile Val Ile Ile Glu Ala Thr Pro Ser Glu Ile Leu Gly Arg Arg
        115                 120                 125

Leu Arg Asp Leu Lys Arg Asp Arg Asp Val Glu Thr Glu Glu Gln Ile
    130                 135                 140

Gln Arg His Gln Asp Leu Asn Arg Ala Ala Ala Ile Ala Tyr Ala Met
145                 150                 155                 160

His Ser Asn Ala Leu Ile Lys Ile Ile Glu Asn His Glu Asp Lys Gly
                165                 170                 175

Leu Glu Glu Ala Val Asn Glu Leu Val Lys Ile Leu Asp Leu Ala Val
            180                 185                 190

Asn Glu Tyr Ala
        195
```

<210> 5

<211> 196

<212> PRT

<213> Pyrococcus horikoshii

<400> 5

```
Met Pro Phe Val Val Ile Ile Thr Gly Ile Pro Gly Val Gly Lys Ser
1               5                  10                  15

Thr Ile Thr Lys Leu Ala Leu Gln Arg Thr Arg Ala Lys Phe Lys Leu
            20                  25                  30

Ile Asn Phe Gly Asp Leu Met Phe Glu Glu Ala Leu Lys Leu Lys Leu
        35                  40                  45

Val Lys His Arg Asp Glu Met Arg Lys Leu Pro Leu Glu Val Gln Arg
    50                  55                  60

Glu Leu Gln Met Asn Ala Ala Lys Lys Ile Ala Glu Met Ala Lys Asn
65                  70                  75                  80

Tyr Pro Ile Leu Leu Asp Thr His Ala Thr Ile Lys Thr Pro His Gly
                85                  90                  95

Tyr Leu Leu Gly Leu Pro Tyr Glu Val Ile Lys Ile Leu Asn Pro Asn
            100                 105                 110

Phe Ile Val Ile Ile Glu Ala Thr Pro Ser Glu Ile Leu Gly Arg Arg
        115                 120                 125

Leu Arg Asp Leu Lys Arg Asp Arg Asp Val Glu Thr Glu Glu Gln Ile
    130                 135                 140

Gln Arg His Gln Asp Leu Asn Arg Ala Ala Ala Ile Thr Tyr Ala Met
145                 150                 155                 160

His Ser Asn Ala Leu Ile Lys Ile Ile Glu Asn His Glu Asp Lys Gly
                165                 170                 175

Leu Glu Glu Ala Val Asn Glu Leu Val Lys Ile Leu Asp Leu Ala Val
            180                 185                 190

Lys Glu Tyr Ala
        195
```

<210> 6

<211> 196

<212> PRT

<213> Pyrococcus abyssi

<400> 6

Met Ser Phe Val Val Ile Ile Thr Gly Ile Pro Gly Val Gly Lys Ser
1 5 10 15

Thr Ile Thr Arg Leu Ala Leu Gln Arg Thr Lys Ala Lys Phe Lys Leu
20 25 30

Ile Asn Phe Gly Asp Leu Met Phe Glu Glu Ala Val Lys Ala Gly Leu
35 40 45

Val Asn His Arg Asp Glu Met Arg Lys Leu Pro Leu Glu Ile Gln Arg
50 55 60

Asp Leu Gln Met Lys Val Ala Lys Lys Ile Ser Glu Met Ala Arg Gln
65 70 75 80

Gln Pro Ile Leu Leu Asp Thr His Ala Thr Ile Lys Thr Pro His Gly
85 90 95

Tyr Leu Leu Gly Leu Pro Tyr Glu Val Ile Lys Thr Leu Asn Pro Asn
100 105 110

Phe Ile Val Ile Ile Glu Ala Thr Pro Ser Glu Ile Leu Gly Arg Arg
115 120 125

Leu Arg Asp Leu Lys Arg Asp Arg Asp Val Glu Thr Glu Glu Gln Ile
130 135 140

Gln Arg His Gln Asp Leu Asn Arg Ala Ala Ala Ile Ala Tyr Ala Met
145 150 155 160

His Ser Asn Ala Leu Ile Lys Ile Ile Glu Asn His Glu Asp Lys Gly
165 170 175

Leu Glu Glu Ala Val Asn Glu Leu Val Glu Ile Leu Asp Leu Ala Val
180 185 190

Lys Glu Tyr Ala
195

<210> 7

<211> 192

<212> PRT

<213> Methanococcus thermolithotrophicus

<400> 7

```
Met Lys Asn Lys Leu Val Val Val Thr Gly Val Pro Gly Val Gly Gly
1               5                  10                  15

Thr Thr Ile Thr Gln Lys Ala Met Glu Lys Leu Ser Glu Glu Gly Ile
            20                  25                  30

Asn Tyr Lys Met Val Asn Phe Gly Thr Val Met Phe Glu Val Ala Gln
        35                  40                  45

Glu Glu Asn Leu Val Glu Asp Arg Asp Gln Met Arg Lys Leu Asp Pro
    50                  55                  60

Asp Thr Gln Lys Arg Ile Gln Lys Leu Ala Gly Arg Lys Ile Ala Glu
65                  70                  75                  80

Met Val Lys Glu Ser Pro Val Val Val Asp Thr His Ser Thr Ile Lys
                85                  90                  95

Thr Pro Lys Gly Tyr Leu Pro Gly Leu Pro Val Trp Val Leu Asn Glu
            100                 105                 110

Leu Asn Pro Asp Ile Ile Ile Val Val Glu Thr Ser Gly Asp Glu Ile
        115                 120                 125

Leu Ile Arg Arg Leu Asn Asp Glu Thr Arg Asn Arg Asp Leu Glu Thr
    130                 135                 140

Thr Ala Gly Ile Glu Glu His Gln Ile Met Asn Arg Ala Ala Ala Met
145                 150                 155                 160

Thr Tyr Gly Val Leu Thr Gly Ala Thr Val Lys Ile Ile Gln Asn Lys
                165                 170                 175

Asn Asn Leu Leu Asp Tyr Ala Val Glu Glu Leu Ile Ser Val Leu Arg
            180                 185                 190
```

<210> 8

<211> 192

<212> PRT

<213> Methanococcus voltae

<400> 8

Met Lys Asn Lys Val Val Val Val Thr Gly Val Pro Gly Val Gly Ser
1 5 10 15

Thr Thr Ser Ser Gln Leu Ala Met Asp Asn Leu Arg Lys Glu Gly Val
20 25 30

Asn Tyr Lys Met Val Ser Phe Gly Ser Val Met Phe Glu Val Ala Lys
35 40 45

Glu Glu Asn Leu Val Ser Asp Arg Asp Gln Met Arg Lys Met Asp Pro
50 55 60

Glu Thr Gln Lys Arg Ile Gln Lys Met Ala Gly Arg Lys Ile Ala Glu
65 70 75 80

Met Ala Lys Glu Ser Pro Val Ala Val Asp Thr His Ser Thr Val Ser
85 90 95

Thr Pro Lys Gly Tyr Leu Pro Gly Leu Pro Ser Trp Val Leu Asn Glu
100 105 110

Leu Asn Pro Asp Leu Ile Ile Val Val Glu Thr Thr Gly Asp Glu Ile
115 120 125

Leu Met Arg Arg Met Ser Asp Glu Thr Arg Val Arg Asp Leu Asp Thr
130 135 140

Ala Ser Thr Ile Glu Gln His Gln Phe Met Asn Arg Cys Ala Ala Met
145 150 155 160

Ser Tyr Gly Val Leu Thr Gly Ala Thr Val Lys Ile Val Gln Asn Arg
165 170 175

Asn Gly Leu Leu Asp Gln Ala Val Glu Glu Leu Thr Asn Val Leu Arg
180 185 190

<210> 9

<211> 195

<212> PRT

<213> Methanococcus jannaschii

<400> 9

Met Met Met Met Lys Asn Lys Val Val Val Ile Val Gly Val Pro Gly
1 5 10 15

Val Gly Ser Thr Thr Val Thr Asn Lys Ala Ile Glu Glu Leu Lys Lys
20 25 30

Glu Gly Ile Glu Tyr Lys Ile Val Asn Phe Gly Thr Val Met Phe Glu
35 40 45

Ile Ala Lys Glu Glu Gly Leu Val Glu His Arg Asp Gln Leu Arg Lys
50 55 60

Leu Pro Pro Glu Glu Gln Lys Arg Ile Gln Lys Leu Ala Gly Lys Lys
65 70 75 80

Ile Ala Glu Met Ala Lys Glu Phe Asn Ile Val Val Asp Thr His Ser
85 90 95

Thr Ile Lys Thr Pro Lys Gly Tyr Leu Pro Gly Leu Pro Ala Trp Val
100 105 110

Leu Glu Glu Leu Asn Pro Asp Ile Ile Val Leu Val Glu Ala Glu Asn
115 120 125

Asp Glu Ile Leu Met Arg Arg Leu Lys Asp Glu Thr Arg Gln Arg Asp
130 135 140

Phe Glu Ser Thr Glu Asp Ile Gly Glu His Ile Phe Met Asn Arg Cys
145 150 155 160

Ala Ala Met Thr Tyr Ala Val Leu Thr Gly Ala Thr Val Lys Ile Ile
165 170 175

Lys Asn Arg Asp Phe Leu Leu Asp Lys Ala Val Gln Glu Leu Ile Glu
180 185 190

Val Leu Lys
195

<210> 10

<211> 191

<212> PRT

<213> Methanopyrus kandleri

<400> 10

Met Gly Tyr Val Ile Val Ala Thr Gly Val Pro Gly Val Gly Ala Thr
1 5 10 15

Thr Val Thr Thr Glu Ala Val Lys Glu Leu Glu Gly Tyr Glu His Val
20 25 30

Asn Tyr Gly Asp Val Met Leu Glu Ile Ala Lys Glu Glu Gly Leu Val
35 40 45

Glu His Arg Asp Glu Ile Arg Lys Leu Pro Ala Glu Lys Gln Arg Glu
50 55 60

Ile Gln Arg Leu Ala Ala Arg Arg Ile Ala Lys Met Ala Glu Glu Lys
65 70 75 80

Glu Gly Ile Ile Val Asp Thr His Cys Thr Ile Lys Thr Pro Ala Gly
85 90 95

Tyr Leu Pro Gly Leu Pro Ile Trp Val Leu Glu Glu Leu Gln Pro Asp
100 105 110

Val Ile Val Leu Ile Glu Ala Asp Pro Asp Glu Ile Met Met Arg Arg
115 120 125

Val Lys Asp Ser Glu Glu Arg Gln Arg Asp Tyr Asp Arg Ala His Glu
130 135 140

Ile Glu Glu His Gln Lys Met Asn Arg Met Ala Ala Met Ala Tyr Ala
145 150 155 160

Ala Leu Thr Gly Ala Thr Val Lys Ile Ile Glu Asn His Asp Asp Arg
165 170 175

Leu Glu Glu Ala Val Arg Glu Phe Val Glu Thr Val Arg Ser Leu
180 185 190

<210> 11

<211> 192

<212> PRT

<213> Methanotorris igneus

<400> 11

Met Lys Asn Lys Val Val Val Val Thr Gly Val Pro Gly Val Gly Gly
1 5 10 15

Thr Thr Leu Thr Gln Lys Thr Ile Glu Lys Leu Lys Glu Glu Gly Ile
20 25 30

Glu Tyr Lys Met Val Asn Phe Gly Thr Val Met Phe Glu Val Ala Lys
35 40 45

Glu Glu Gly Leu Val Glu Asp Arg Asp Gln Met Arg Lys Leu Asp Pro
50 55 60

Asp Thr Gln Lys Arg Ile Gln Lys Leu Ala Gly Arg Lys Ile Ala Glu
65 70 75 80

Met Ala Lys Glu Ser Asn Val Ile Val Asp Thr His Ser Thr Val Lys
85 90 95

Thr Pro Lys Gly Tyr Leu Ala Gly Leu Pro Ile Trp Val Leu Glu Glu
100 105 110

Leu Asn Pro Asp Ile Ile Val Ile Val Glu Thr Ser Ser Asp Glu Ile
115 120 125

Leu Met Arg Arg Leu Gly Asp Ala Thr Arg Asn Arg Asp Ile Glu Leu
130 135 140

Thr Ser Asp Ile Asp Glu His Gln Phe Met Asn Arg Cys Ala Ala Met
145 150 155 160

Ala Tyr Gly Val Leu Thr Gly Ala Thr Val Lys Ile Ile Lys Asn Arg
165 170 175

Asp Gly Leu Leu Asp Lys Ala Val Glu Glu Leu Ile Ser Val Leu Lys
180 185 190

<210> 12

<211> 197

<212> PRT

<213> Pyrobaculum aerophilum

<400> 12

Met Lys Ile Val Ile Val Ala Leu Pro Gly Ser Gly Lys Thr Thr Ile
1 5 10 15

Leu Asn Phe Val Lys Gln Lys Leu Pro Asp Val Lys Ile Val Asn Tyr
20 25 30

Gly Asp Val Met Leu Glu Ile Ala Lys Lys Arg Phe Gly Ile Gln His
35 40 45

Arg Asp Glu Met Arg Lys Lys Ile Pro Val Asp Glu Tyr Arg Lys Val
50 55 60

Gln Glu Glu Ala Ala Glu Tyr Ile Ala Ser Leu Thr Gly Asp Val Ile
65 70 75 80

Ile Asp Thr His Ala Ser Ile Lys Ile Gly Gly Gly Tyr Tyr Pro Gly
85 90 95

Leu Pro Asp Arg Ile Ile Ser Lys Leu Lys Pro Asp Val Ile Leu Leu
100 105 110

Leu Glu Tyr Asp Pro Lys Val Ile Leu Glu Arg Arg Lys Lys Asp Pro
115 120 125

Asp Arg Phe Arg Asp Leu Glu Ser Glu Glu Glu Ile Glu Met His Gln
130 135 140

Gln Ala Asn Arg Tyr Tyr Ala Phe Ala Ala Ala Asn Ala Gly Glu Ser
145 150 155 160

Thr Val His Val Leu Asn Phe Arg Gly Lys Pro Glu Ser Arg Pro Phe
165 170 175

Glu His Ala Glu Val Ala Ala Glu Tyr Ile Val Asn Leu Ile Leu Arg
180 185 190

Thr Arg Gln Lys Ser
195

<210> 13

<211> 220

<212> PRT

<213> Thermotoga maritima

<400> 13

Met Met Ala Tyr Leu Val Phe Leu Gly Pro Pro Gly Ala Gly Lys Gly
1 5 10 15

Thr Tyr Ala Lys Arg Ile Gln Glu Lys Thr Gly Ile Pro His Ile Ser
20 25 30

Thr Gly Asp Ile Phe Arg Asp Ile Val Lys Lys Glu Asn Asp Glu Leu
35 40 45

Gly Lys Lys Ile Lys Glu Ile Met Glu Lys Gly Glu Leu Val Pro Asp
50 55 60

Glu Leu Val Asn Glu Val Val Lys Arg Arg Leu Ser Glu Lys Asp Cys
65 70 75 80

Glu Lys Gly Phe Ile Leu Asp Gly Tyr Pro Arg Thr Val Ala Gln Ala
85 90 95

Glu Phe Leu Asp Ser Phe Leu Glu Ser Gln Asn Lys Gln Leu Thr Ala
100 105 110

Ala Val Leu Phe Asp Val Pro Glu Asp Val Val Val Gln Arg Leu Thr
115 120 125

Ser Arg Arg Ile Cys Pro Lys Cys Gly Arg Ile Tyr Asn Met Ile Ser
130 135 140

Leu Pro Pro Lys Glu Asp Glu Leu Cys Asp Asp Cys Lys Val Lys Leu
145 150 155 160

Val Gln Arg Asp Asp Asp Lys Glu Glu Thr Val Arg His Arg Tyr Lys
165 170 175

Val Tyr Leu Glu Lys Thr Gln Pro Val Ile Asp Tyr Tyr Gly Lys Lys
180 185 190

Gly Ile Leu Lys Arg Val Asp Gly Thr Ile Gly Ile Asp Asn Val Val
195 200 205

Ala Glu Val Leu Lys Ile Ile Gly Trp Ser Asp Lys
210 215 220

<210> 14

<211> 204

<212> PRT

<213> Aeropyrum pernix

<400> 14

Met Lys Val Arg His Pro Phe Lys Val Val Val Val Thr Gly Val Pro
1 5 10 15

Gly Val Gly Lys Thr Thr Val Ile Lys Glu Leu Gln Gly Leu Ala Glu
20 25 30

Lys Glu Gly Val Lys Leu His Ile Val Asn Phe Gly Ser Phe Met Leu
35 40 45

Asp Thr Ala Val Lys Leu Gly Leu Val Glu Asp Arg Asp Lys Ile Arg
50 55 60

Thr Leu Pro Leu Arg Arg Gln Leu Glu Leu Gln Arg Glu Ala Ala Lys
65 70 75 80

Arg Ile Val Ala Glu Ala Ser Lys Ala Leu Gly Gly Asp Gly Val Leu
85 90 95

Ile Ile Asp Thr His Ala Leu Val Lys Thr Val Ala Gly Tyr Trp Pro
100 105 110

Gly Leu Pro Lys His Val Leu Asp Glu Leu Lys Pro Asp Met Ile Ala
115 120 125

Val Val Glu Ala Ser Pro Glu Glu Val Ala Ala Arg Gln Ala Arg Asp
130 135 140

Thr Thr Arg Tyr Arg Val Asp Ile Gly Gly Val Glu Gly Val Lys Arg
145 150 155 160

Leu Met Glu Asn Ala Arg Ala Ala Ser Ile Ala Ser Ala Ile Gln Tyr
165 170 175

Ala Ser Thr Val Ala Ile Val Glu Asn Arg Glu Gly Glu Ala Ala Lys
180 185 190

Ala Ala Glu Glu Leu Leu Arg Leu Ile Lys Asn Leu
195 200

<210> 15

<211> 216

<212> PRT

<213> Archaeoglobus fulgidus

<400> 15

Met Asn Leu Ile Phe Leu Gly Pro Pro Gly Ala Gly Lys Gly Thr Gln
1 5 10 15

Ala Lys Arg Val Ser Glu Lys Tyr Gly Ile Pro Gln Ile Ser Thr Gly
20 25 30

Asp Met Leu Arg Glu Ala Val Ala Lys Gly Thr Glu Leu Gly Lys Lys
35 40 45

Ala Lys Glu Tyr Met Asp Lys Gly Glu Leu Val Pro Asp Glu Val Val
50 55 60

Ile Gly Ile Val Lys Glu Arg Leu Gln Gln Pro Asp Cys Glu Lys Gly
65 70 75 80

Phe Ile Leu Asp Gly Phe Pro Arg Thr Leu Ala Gln Ala Glu Ala Leu
85 90 95

Asp Glu Met Leu Lys Glu Leu Asn Lys Lys Ile Asp Ala Val Ile Asn
100 105 110

Val Val Val Pro Glu Glu Glu Val Val Lys Arg Ile Thr Tyr Arg Arg
115 120 125

Thr Cys Arg Asn Cys Gly Ala Val Tyr His Leu Ile Tyr Ala Pro Pro
130 135 140

Lys Glu Asp Asn Lys Cys Asp Lys Cys Gly Gly Glu Leu Tyr Gln Arg
145 150 155 160

Asp Asp Lys Glu Glu Thr Val Arg Glu Arg Tyr Arg Val Tyr Lys Gln
165 170 175

Asn Thr Glu Pro Leu Ile Asp Tyr Tyr Arg Lys Lys Gly Ile Leu Tyr
180 185 190

Asp Val Asp Gly Thr Lys Asp Ile Glu Gly Val Trp Lys Glu Ile Glu
195 200 205

Ala Ile Leu Glu Lys Ile Lys Ser
210 215

<210> 16

<211> 220

<212> PRT

<213> Pyrococcus abyssi

<400> 16

Met Asn Ile Leu Ile Phe Gly Pro Pro Gly Ser Gly Lys Ser Thr Gln
1 5 10 15

Ala Arg Arg Ile Thr Glu Arg Tyr Gly Leu Thr Tyr Ile Ala Ser Gly
20 25 30

Asp Ile Ile Arg Ala Glu Ile Lys Ala Arg Thr Pro Leu Gly Ile Glu
35 40 45

Met Glu Arg Tyr Leu Ser Arg Gly Asp Leu Ile Pro Asp Thr Ile Val
50 55 60

Asn Thr Leu Ile Ile Ser Lys Leu Arg Arg Val Arg Glu Asn Phe Ile
65 70 75 80

Met Asp Gly Tyr Pro Arg Thr Pro Glu Gln Val Ile Thr Leu Glu Asn
85 90 95

Tyr Leu Tyr Asp His Gly Ile Lys Leu Asp Val Ala Ile Asp Ile Tyr
100 105 110

Ile Thr Lys Glu Glu Ser Val Arg Arg Ile Ser Gly Arg Arg Ile Cys
115 120 125

Ser Lys Cys Gly Ala Val Tyr His Val Glu Phe Asn Pro Pro Lys Val
130 135 140

Pro Gly Lys Cys Asp Ile Cys Gly Gly Glu Leu Ile Gln Arg Pro Asp
145 150 155 160

Asp Arg Pro Glu Ile Val Glu Lys Arg Tyr Asp Ile Tyr Ser Lys Asn
165 170 175

Met Glu Pro Ile Ile Lys Phe Tyr Gln Lys Gln Gly Ile Tyr Val Arg
180 185 190

Ile Asp Gly His Gly Ser Ile Asp Glu Val Trp Glu Arg Ile Arg Pro
195 200 205

Leu Leu Asp Tyr Ile Tyr Asn Gln Glu Asn Arg Arg
210 215 220

<210> 17

<211> 196

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic

<220>

<221> MISC_FEATURE

<222> (61)..(61)

<223> The amino acid "Xaa" may be K or E.

<220>

<221> MISC_FEATURE

<222> (75)..(75)

<223> The amino acid "Xaa" may be T or A.

<220>

<221> MISC_FEATURE

<222> (98)..(98)

<223> The amino acid "Xaa" may be M or L.

<220>

<221> MISC_FEATURE

<222> (157)..(157)

<223> The amino acid "Xaa" may be A, or a small hydrophobic residue (e.g. I or L) or a large hydrophobic residue (e.g. F), that increases the thermal stability of the enzyme.

<400> 17

```
Met Pro Phe Val Val Ile Ile Thr Gly Ile Pro Gly Val Gly Lys Ser
1               5                  10                  15

Thr Ile Thr Arg Leu Ala Leu Gln Arg Thr Lys Ala Lys Phe Arg Leu
            20                  25                  30

Ile Asn Phe Gly Asp Leu Met Phe Glu Glu Ala Val Lys Ala Gly Leu
        35                  40                  45

Val Lys His Arg Asp Glu Met Arg Lys Leu Pro Leu Xaa Ile Gln Arg
    50                  55                  60

Glu Leu Gln Met Lys Ala Ala Lys Lys Ile Xaa Glu Met Ala Lys Glu
65                  70                  75                  80

His Pro Ile Leu Val Asp Thr His Ala Thr Ile Lys Thr Pro His Gly
                85                  90                  95

Tyr Xaa Leu Gly Leu Pro Tyr Glu Val Val Lys Thr Leu Asn Pro Asn
            100                 105                 110

Phe Ile Val Ile Ile Glu Ala Thr Pro Ser Glu Ile Leu Gly Arg Arg
        115                 120                 125
```

Leu Arg Asp Leu Lys Arg Asp Arg Asp Val Glu Thr Glu Glu Gln Ile
130 135 140

Gln Arg His Gln Asp Leu Asn Arg Ala Ala Ala Ile Xaa Tyr Ala Met
145 150 155 160

His Ser Asn Ala Leu Ile Lys Ile Ile Glu Asn His Glu Asp Lys Gly
165 170 175

Leu Glu Glu Ala Val Asn Glu Leu Val Lys Ile Leu Asp Leu Ala Val
180 185 190

Asn Glu Tyr Ala
195

<210> 18

<211> 196

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic

<220>

<221> MISC_FEATURE

<222> (47)..(47)

<223> The amino acid "Xaa" may be G, or may be any other residue that inc reases the thermal stability of the enzyme.

<220>

<221> MISC_FEATURE

<222> (157)..(157)

<223> The amino acid "Xaa" may be A, or a small hydrophobic residue (e.g. I or L) or a large hydrophobic residue (e.g. F), that increases the thermal stability of the enzyme.

<400> 18

Met Pro Phe Val Val Ile Ile Thr Gly Ile Pro Gly Val Gly Lys Ser
1 5 10 15

Thr Ile Thr Lys Leu Ala Leu Gln Arg Thr Arg Ala Lys Phe Lys Leu
20 25 30

Ile Asn Phe Gly Asp Leu Met Phe Glu Glu Ala Leu Lys Leu Xaa Leu
35 40 45

Val Lys His Arg Asp Glu Met Arg Lys Leu Pro Leu Glu Val Gln Arg
50 55 60

Glu Leu Gln Met Asn Ala Ala Lys Lys Ile Ala Glu Met Ala Lys Asn
65 70 75 80

Tyr Pro Ile Leu Leu Asp Thr His Ala Thr Ile Lys Thr Pro His Gly
85 90 95

Tyr Leu Leu Gly Leu Pro Tyr Glu Val Ile Lys Ile Leu Asn Pro Asn
100 105 110

Phe Ile Val Ile Ile Glu Ala Thr Pro Ser Glu Ile Leu Gly Arg Arg
115 120 125

Leu Arg Asp Leu Lys Arg Asp Arg Asp Val Glu Thr Glu Glu Gln Ile
130 135 140

Gln Arg His Gln Asp Leu Asn Arg Ala Ala Ala Ile Xaa Tyr Ala Met
145 150 155 160

His Ser Asn Ala Leu Ile Lys Ile Ile Glu Asn His Glu Asp Lys Gly
165 170 175

Leu Glu Glu Ala Val Asn Glu Leu Val Lys Ile Leu Asp Leu Ala Val
180 185 190

Lys Glu Tyr Ala
195

<210> 19

<211> 194

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic

<220>

<221> MISC_FEATURE

<222> (103)..(103)

<223> The amino acid "Xaa" may be A or M.

<400> 19

Met Lys Ile Gly Ile Val Thr Gly Ile Pro Gly Val Gly Lys Ser Thr
1 5 10 15

Val Leu Ala Lys Val Lys Glu Ile Leu Asp Asn Gln Gly Ile Asn Asn
20 25 30

Lys Ile Ile Asn Tyr Gly Asp Phe Met Leu Ala Thr Ala Leu Lys Leu
35 40 45

Gly Tyr Ala Lys Asp Arg Asp Glu Met Arg Lys Leu Ser Val Glu Lys
50 55 60

Gln Lys Lys Leu Gln Ile Asp Ala Ala Lys Gly Ile Ala Glu Glu Ala
65 70 75 80

Arg Ala Gly Gly Glu Gly Tyr Leu Phe Ile Asp Thr His Ala Val Ile
85 90 95

Arg Thr Pro Ser Gly Tyr Xaa Pro Gly Leu Pro Ser Tyr Val Ile Thr
100 105 110

Glu Ile Asn Pro Ser Val Ile Phe Leu Leu Glu Ala Asp Pro Lys Ile
115 120 125

Ile Leu Ser Arg Gln Lys Arg Asp Thr Thr Arg Asn Arg Asn Asp Tyr
130 135 140

Ser Asp Glu Ser Val Ile Leu Glu Thr Ile Asn Phe Ala Arg Tyr Ala
145 150 155 160

Ala Thr Ala Ser Ala Val Leu Ala Gly Ser Thr Val Lys Val Ile Val
165 170 175

Asn Val Glu Gly Asp Pro Ser Ile Ala Ala Asn Glu Ile Ile Arg Ser
180 185 190

Met Lys

<210> 20

<211> 403

<212> PRT

<213> Thermotoga maritima

<400> 20

Met Arg Val Leu Val Ile Asn Ser Gly Ser Ser Ser Ile Lys Tyr Gln
1 5 10 15

Leu Ile Glu Met Glu Gly Glu Lys Val Leu Cys Lys Gly Ile Ala Glu
20 25 30

Arg Ile Gly Ile Glu Gly Ser Arg Leu Val His Arg Val Gly Asp Glu
35 40 45

Lys His Val Ile Glu Arg Glu Leu Pro Asp His Glu Glu Ala Leu Lys
50 55 60

Leu Ile Leu Asn Thr Leu Val Asp Glu Lys Leu Gly Val Ile Lys Asp
65 70 75 80

Leu Lys Glu Ile Asp Ala Val Gly His Arg Val Val His Gly Gly Glu
85 90 95

Arg Phe Lys Glu Ser Val Leu Val Asp Glu Glu Val Leu Lys Ala Ile
100 105 110

Glu Glu Val Ser Pro Leu Ala Pro Leu His Asn Pro Ala Asn Leu Met
115 120 125

Gly Ile Lys Ala Ala Met Lys Leu Leu Pro Gly Val Pro Asn Val Ala
130 135 140

Val Phe Asp Thr Ala Phe His Gln Thr Ile Pro Gln Lys Ala Tyr Leu
145 150 155 160

Tyr Ala Ile Pro Tyr Glu Tyr Tyr Glu Lys Tyr Lys Ile Arg Arg Tyr
165 170 175

Gly Phe His Gly Thr Ser His Arg Tyr Val Ser Lys Arg Ala Ala Glu
180 185 190

Ile Leu Gly Lys Lys Leu Glu Glu Leu Lys Ile Ile Thr Cys His Ile
195 200 205

Gly Asn Gly Ala Ser Val Ala Ala Val Lys Tyr Gly Lys Cys Val Asp
210 215 220

Thr Ser Met Gly Phe Thr Pro Leu Glu Gly Leu Val Met Gly Thr Arg
225 230 235 240

Ser Gly Asp Leu Asp Pro Ala Ile Pro Phe Phe Ile Met Glu Lys Glu
245 250 255

Gly Ile Ser Pro Gln Glu Met Tyr Asp Ile Leu Asn Lys Lys Ser Gly
260 265 270

Val Tyr Gly Leu Ser Lys Gly Phe Ser Ser Asp Met Arg Asp Ile Glu
275 280 285

Glu Ala Ala Leu Lys Gly Asp Glu Trp Cys Lys Leu Val Leu Glu Ile
290 295 300

Tyr Asp Tyr Arg Ile Ala Lys Tyr Ile Gly Ala Tyr Ala Ala Ala Met
305 310 315 320

Asn Gly Val Asp Ala Ile Val Phe Thr Ala Gly Val Gly Glu Asn Ser
325 330 335

Pro Ile Thr Arg Glu Asp Val Cys Ser Tyr Leu Glu Phe Leu Gly Val
340 345 350

Lys Leu Asp Lys Gln Lys Asn Glu Glu Thr Ile Arg Gly Lys Glu Gly
355 360 365

Ile Ile Ser Thr Pro Asp Ser Arg Val Lys Val Leu Val Val Pro Thr
370 375 380

Asn Glu Glu Leu Met Ile Ala Arg Asp Thr Lys Glu Ile Val Glu Lys
385 390 395 400

Ile Gly Arg

<210> 21

<211> 478

<212> PRT

<213> Pyrococcus horikoshii

<400> 21

Met Arg Arg Met Lys Leu Pro Ser His Lys Thr Lys Ile Val Ala Thr
1 5 10 15

Ile Gly Pro Ala Thr Asn Ser Lys Lys Met Ile Lys Lys Leu Ile Glu
20 25 30

Ala Gly Met Asn Val Ala Arg Ile Asn Phe Ser His Gly Thr Phe Glu
35 40 45

Glu His Ala Lys Ile Ile Glu Met Val Arg Glu Gln Ser Gln Lys Leu
50 55 60

Asp Arg Arg Val Ala Ile Leu Ala Asp Leu Pro Gly Leu Lys Ile Arg
65 70 75 80

Val Gly Glu Ile Lys Gly Gly Tyr Val Glu Leu Glu Arg Gly Glu Lys
85 90 95

Val Thr Leu Thr Thr Lys Asp Ile Glu Gly Asp Glu Thr Thr Ile Pro
100 105 110

Val Glu Tyr Lys Asp Phe Pro Lys Leu Val Ser Lys Gly Asp Val Ile
115 120 125

Tyr Leu Ser Asp Gly Tyr Ile Val Leu Arg Val Glu Asp Val Lys Glu
130 135 140

Asn Glu Val Glu Ala Val Val Ile Ser Gly Gly Lys Leu Phe Ser Arg
145 150 155 160

Lys Gly Ile Asn Ile Pro Lys Ala Tyr Leu Pro Val Glu Ala Ile Thr
165 170 175

Pro Arg Asp Ile Glu Ile Met Lys Phe Ala Ile Glu His Gly Val Asp
180 185 190

Ala Ile Gly Leu Ser Phe Val Gly Asn Val Tyr Asp Val Leu Lys Ala
195 200 205

Lys Ser Phe Leu Glu Arg Asn Gly Ala Gly Asp Thr Phe Val Ile Ala
210 215 220

Lys Ile Glu Arg Pro Asp Ala Val Arg Asn Phe Asn Glu Ile Leu Asn
225 230 235 240

Ala Ala Asp Gly Ile Met Ile Ala Arg Gly Asp Leu Gly Val Glu Met
245 250 255

Pro Ile Glu Gln Leu Pro Ile Leu Gln Lys Arg Leu Ile Arg Lys Ala
260 265 270

Asn Met Glu Gly Lys Pro Val Ile Thr Ala Thr Gln Met Leu Val Ser
275 280 285

Met Thr Met Glu Lys Val Pro Thr Arg Ala Glu Val Thr Asp Val Ala
290 295 300

Asn Ala Ile Leu Asp Gly Thr Asp Ala Val Met Leu Ser Glu Glu Thr
305 310 315 320

Ala Val Gly Lys Phe Pro Ile Glu Ala Val Glu Met Met Ala Arg Ile
325 330 335

Ala Lys Val Thr Glu Glu Tyr Arg Glu Ser Phe Gly Ile Thr Arg Met
340 345 350

Arg Glu Phe Leu Glu Gly Thr Lys Arg Gly Thr Ile Lys Glu Ala Ile
355 360 365

Thr Arg Ser Ile Ile Asp Ala Ile Cys Thr Ile Gly Ile Lys Phe Ile
370 375 380

Leu Thr Pro Thr Lys Thr Gly Arg Thr Ala Arg Leu Ile Ser Arg Phe
385 390 395 400

Lys Pro Lys Gln Trp Ile Leu Ala Phe Ser Thr Arg Glu Lys Val Cys
405 410 415

Asn Asn Leu Met Phe Ser Tyr Gly Val Tyr Pro Phe Cys Met Glu Glu
420 425 430

Gly Phe Asn Glu Asn Asp Ile Val Arg Leu Ile Lys Gly Leu Gly Leu
435 440 445

Val Gly Ser Asp Asp Ile Val Leu Met Thr Glu Gly Lys Pro Ile Glu
450 455 460

Lys Thr Val Gly Thr Asn Ser Ile Lys Ile Phe Gln Ile Ala
465 470 475

<210> 22

<211> 452

<212> PRT

<213> Sulfolobus solfataricus

<400> 22

Met Arg Lys Thr Lys Ile Val Ala Thr Leu Gly Pro Ser Ser Glu Glu
1 5 10 15

Lys Val Lys Glu Leu Ala Glu Tyr Val Asp Val Phe Arg Ile Asn Phe
20 25 30

Ala His Gly Asp Glu Thr Ser His Arg Lys Tyr Phe Asp Leu Ile Arg
35 40 45

Thr Tyr Ala Pro Glu Ser Ser Ile Ile Val Asp Leu Pro Gly Pro Lys
50 55 60

Leu Arg Leu Gly Glu Leu Lys Glu Pro Ile Glu Val Lys Lys Gly Asp
65 70 75 80

Lys Ile Val Phe Ser Gln Lys Asp Gly Ile Pro Val Asp Asp Glu Leu
85 90 95

Phe Tyr Ser Ala Val Lys Glu Asn Ser Asp Ile Leu Ile Ala Asp Gly
100 105 110

Thr Ile Arg Val Arg Val Lys Ser Lys Ala Lys Asp Arg Val Glu Gly
115 120 125

```
Thr Val Ile Glu Gly Gly Ile Leu Leu Ser Arg Lys Gly Ile Asn Ile
    130                 135                 140

Pro Asn Val Asn Leu Lys Ser Gly Ile Thr Asp Asn Asp Leu Lys Leu
145                 150                 155                 160

Leu Lys Arg Ala Leu Asp Leu Gly Ala Asp Tyr Ile Gly Leu Ser Phe
                165                 170                 175

Val Ile Ser Glu Asn Asp Val Lys Lys Val Lys Glu Phe Val Gly Asp
            180                 185                 190

Glu Ala Trp Val Ile Ala Lys Ile Glu Lys Ser Glu Ala Leu Lys Asn
        195                 200                 205

Leu Thr Asn Ile Val Asn Glu Ser Asp Gly Ile Met Val Ala Arg Gly
    210                 215                 220

Asp Leu Gly Val Glu Thr Gly Leu Glu Asn Leu Pro Leu Ile Gln Arg
225                 230                 235                 240

Arg Ile Val Arg Thr Ser Arg Val Phe Gly Lys Pro Val Ile Leu Ala
                245                 250                 255

Thr Gln Val Leu Thr Ser Met Ile Asn Ser Pro Ile Pro Thr Arg Ala
            260                 265                 270

Glu Ile Ile Asp Ile Ser Asn Ser Ile Met Gln Gly Val Asp Ser Ile
        275                 280                 285

Met Leu Ser Asp Glu Thr Ala Ile Gly Asn Tyr Pro Val Glu Ser Val
    290                 295                 300

Arg Thr Leu His Asn Ile Ile Ser Asn Val Glu Lys Ser Val Lys His
305                 310                 315                 320

Arg Pro Ile Gly Pro Leu Asn Ser Glu Ser Asp Ala Ile Ala Leu Ala
                325                 330                 335

Ala Val Asn Ala Ser Lys Val Ser Lys Ala Asp Val Ile Val Val Tyr
            340                 345                 350

Ser Arg Ser Gly Asn Ser Ile Leu Arg Val Ser Arg Leu Arg Pro Glu
        355                 360                 365
```

Arg Asn Ile Ile Gly Val Ser Pro Asp Pro Arg Leu Ala Lys Lys Phe
370 375 380

Lys Leu Cys Tyr Gly Val Ile Pro Ile Ser Ile Asn Lys Lys Met Gln
385 390 395 400

Ser Ile Asp Glu Ile Ile Asp Val Ser Ala Lys Leu Met Gln Glu Lys
405 410 415

Ile Lys Asp Leu Lys Phe Lys Lys Ile Val Ile Val Gly Gly Asp Pro
420 425 430

Lys Gln Glu Ala Gly Lys Thr Asn Phe Val Ile Val Lys Thr Leu Glu
435 440 445

Gln Gln Lys Lys
450

<210> 23

<211> 466

<212> PRT

<213> Thermotoga maritima

<400> 23

Met Arg Ser Thr Lys Ile Val Cys Thr Val Gly Pro Arg Thr Asp Ser
1 5 10 15

Tyr Glu Met Ile Glu Lys Met Ile Asp Leu Gly Val Asn Val Phe Arg
20 25 30

Ile Asn Thr Ser His Gly Asp Trp Asn Glu Gln Glu Gln Lys Ile Leu
35 40 45

Lys Ile Lys Asp Leu Arg Glu Lys Lys Lys Lys Pro Val Ala Ile Leu
50 55 60

Ile Asp Leu Ala Gly Pro Lys Ile Arg Thr Gly Tyr Leu Glu Lys Glu
65 70 75 80

Phe Val Glu Leu Lys Glu Gly Gln Ile Phe Thr Leu Thr Thr Lys Glu
85 90 95

Ile Leu Gly Asn Glu His Ile Val Ser Val Asn Leu Ser Ser Leu Pro
100 105 110

Lys Asp Val Lys Lys Gly Asp Thr Ile Leu Leu Ser Asp Gly Glu Ile
115 120 125

Val Leu Glu Val Ile Glu Thr Thr Asp Thr Glu Val Lys Thr Val Val
130 135 140

Lys Val Gly Gly Lys Ile Thr His Arg Arg Gly Val Asn Val Pro Thr
145 150 155 160

Ala Asp Leu Ser Val Glu Ser Ile Thr Asp Arg Asp Arg Glu Phe Ile
165 170 175

Lys Leu Gly Thr Leu His Asp Val Glu Phe Phe Ala Leu Ser Phe Val
180 185 190

Arg Lys Pro Glu Asp Val Leu Lys Ala Lys Glu Glu Ile Arg Lys His
195 200 205

Gly Lys Glu Ile Pro Val Ile Ser Lys Ile Glu Thr Lys Lys Ala Leu
210 215 220

Glu Arg Leu Glu Glu Ile Ile Lys Val Ser Asp Gly Ile Met Val Ala
225 230 235 240

Arg Gly Asp Leu Gly Val Glu Ile Pro Ile Glu Glu Val Pro Ile Val
245 250 255

Gln Lys Glu Ile Ile Lys Leu Ser Lys Tyr Tyr Ser Lys Pro Val Ile
260 265 270

Val Ala Thr Gln Ile Leu Glu Ser Met Ile Glu Asn Pro Phe Pro Thr
275 280 285

Arg Ala Glu Val Thr Asp Ile Ala Asn Ala Ile Phe Asp Gly Ala Asp
290 295 300

Ala Leu Leu Leu Thr Ala Glu Thr Ala Val Gly Lys His Pro Leu Glu
305 310 315 320

Ala Ile Lys Val Leu Ser Lys Val Ala Lys Glu Ala Glu Lys Lys Leu
325 330 335

```
Glu Phe Phe Arg Thr Ile Glu Tyr Asp Thr Ser Asp Ile Ser Glu Ala
            340                 345                 350

Ile Ser His Ala Cys Trp Gln Leu Ser Glu Ser Leu Asn Ala Lys Leu
        355                 360                 365

Ile Ile Thr Pro Thr Ile Ser Gly Ser Thr Ala Val Arg Val Ser Lys
    370                 375                 380

Tyr Asn Val Ser Gln Pro Ile Val Ala Leu Thr Pro Glu Glu Lys Thr
385                 390                 395                 400

Tyr Tyr Arg Leu Ser Leu Val Arg Lys Val Ile Pro Val Leu Ala Glu
                405                 410                 415

Lys Cys Ser Gln Glu Leu Glu Phe Ile Glu Lys Gly Leu Lys Lys Val
            420                 425                 430

Glu Glu Met Gly Leu Ala Glu Lys Gly Asp Leu Val Val Leu Thr Ser
        435                 440                 445

Gly Val Pro Gly Lys Val Gly Thr Thr Asn Thr Ile Arg Val Leu Lys
    450                 455                 460

Val Asp
465
```

<210> 24

<211> 477

<212> PRT

<213> Pyrococcus furiosus

<400> 24

```
Met Arg Arg Val Lys Leu Pro Ser His Lys Thr Lys Ile Val Ala Thr
1               5                   10                  15

Ile Gly Pro Ala Thr Asn Ser Arg Lys Met Ile Lys Gln Leu Ile Lys
            20                  25                  30

Ala Gly Met Asn Val Ala Arg Ile Asn Phe Ser His Gly Ser Phe Glu
        35                  40                  45
```

```
Glu His Ala Arg Val Ile Glu Ile Ile Arg Glu Glu Ala Gln Lys Leu
    50                  55                  60

Asp Arg Arg Val Ala Ile Leu Ala Asp Leu Pro Gly Leu Lys Ile Arg
65                  70                  75                  80

Val Gly Glu Ile Lys Gly Gly Tyr Val Glu Leu Lys Arg Gly Glu Lys
                85                  90                  95

Val Ile Leu Thr Thr Lys Asp Val Glu Gly Asp Glu Thr Thr Ile Pro
            100                 105                 110

Val Asp Tyr Lys Gly Phe Pro Asn Leu Val Ser Lys Gly Asp Ile Ile
        115                 120                 125

Tyr Leu Asn Asp Gly Tyr Ile Val Leu Lys Val Glu Asn Val Arg Glu
    130                 135                 140

Asn Glu Val Glu Ala Val Val Leu Ser Gly Gly Lys Leu Phe Ser Arg
145                 150                 155                 160

Lys Gly Val Asn Ile Pro Lys Ala Tyr Leu Pro Val Glu Ala Ile Thr
                165                 170                 175

Pro Lys Asp Phe Glu Ile Met Lys Phe Ala Ile Glu His Gly Val Asp
            180                 185                 190

Ala Ile Gly Leu Ser Phe Val Gly Ser Val Tyr Asp Val Leu Lys Ala
        195                 200                 205

Lys Ser Phe Leu Glu Lys Asn Asn Ala Glu Asp Val Phe Val Ile Ala
    210                 215                 220

Lys Ile Glu Arg Pro Asp Ala Val Arg Asn Phe Asp Glu Ile Leu Asn
225                 230                 235                 240

Ala Ala Asp Gly Ile Met Ile Ala Arg Gly Asp Leu Gly Val Glu Met
                245                 250                 255

Pro Ile Glu Gln Leu Pro Ile Leu Gln Lys Lys Leu Ile Arg Lys Ala
            260                 265                 270

Asn Met Glu Gly Lys Pro Val Ile Thr Ala Thr Gln Met Leu Val Ser
        275                 280                 285
```

Met Thr Thr Glu Lys Val Pro Thr Arg Ala Glu Val Thr Asp Val Ala
290 295 300

Asn Ala Ile Leu Asp Gly Thr Asp Ala Val Met Leu Ser Glu Glu Thr
305 310 315 320

Ala Ile Gly Lys Phe Pro Ile Glu Thr Val Glu Met Met Gly Lys Ile
325 330 335

Ala Lys Val Thr Glu Glu Tyr Arg Glu Ser Phe Gly Leu Ser Arg Ile
340 345 350

Arg Glu Phe Met Glu Ile Lys Lys Gly Thr Ile Lys Glu Ala Ile Thr
355 360 365

Arg Ser Ile Ile Asp Ala Ile Cys Thr Ile Asp Ile Lys Phe Ile Leu
370 375 380

Thr Pro Thr Arg Thr Gly Arg Thr Ala Arg Leu Ile Ser Arg Phe Lys
385 390 395 400

Pro Lys Gln Trp Ile Leu Ala Phe Ser Thr Asn Glu Arg Val Cys Asn
405 410 415

Asn Leu Met Phe Ser Tyr Gly Val Tyr Pro Phe Cys Leu Glu Glu Gly
420 425 430

Phe Asp Glu Asn Asp Ile Val Arg Leu Ile Lys Gly Leu Gly Leu Val
435 440 445

Glu Ser Asp Asp Met Val Leu Met Thr Glu Gly Lys Pro Ile Glu Lys
450 455 460

Thr Val Gly Thr Asn Ser Ile Lys Ile Phe Gln Ile Ala
465 470 475

<210> 25

<211> 408

<212> PRT

<213> Methanosarcina thermophila

<400> 25

Met Lys Val Leu Val Ile Asn Ala Gly Ser Ser Ser Leu Lys Tyr Gln
1 5 10 15

```
Leu Ile Asp Met Thr Asn Glu Ser Ala Leu Ala Val Gly Leu Cys Glu
            20                  25                  30

Arg Ile Gly Ile Asp Asn Ser Ile Ile Thr Gln Lys Lys Phe Asp Gly
        35                  40                  45

Lys Lys Leu Glu Lys Leu Thr Asp Leu Pro Thr His Lys Asp Ala Leu
    50                  55                  60

Glu Glu Val Val Lys Ala Leu Thr Asp Asp Glu Phe Gly Val Ile Lys
65                  70                  75                  80

Asp Met Gly Glu Ile Asn Ala Val Gly His Arg Val Val His Gly Gly
                85                  90                  95

Glu Lys Phe Thr Thr Ser Ala Leu Tyr Asp Glu Gly Val Glu Lys Ala
            100                 105                 110

Ile Lys Asp Cys Phe Glu Leu Ala Pro Leu His Asn Pro Pro Asn Met
        115                 120                 125

Met Gly Ile Ser Ala Cys Ala Glu Ile Met Pro Gly Thr Pro Met Val
    130                 135                 140

Ile Val Phe Asp Thr Ala Phe His Gln Thr Met Pro Pro Tyr Ala Tyr
145                 150                 155                 160

Met Tyr Ala Leu Pro Tyr Asp Leu Tyr Glu Lys His Gly Val Arg Lys
                165                 170                 175

Tyr Gly Phe His Gly Thr Ser His Lys Tyr Val Ala Glu Arg Ala Ala
            180                 185                 190

Leu Met Leu Gly Lys Pro Ala Glu Glu Thr Lys Ile Ile Thr Cys His
        195                 200                 205

Leu Gly Asn Gly Ser Ser Ile Thr Ala Val Glu Gly Gly Lys Ser Val
    210                 215                 220

Glu Thr Ser Met Gly Phe Thr Pro Leu Glu Gly Leu Ala Met Gly Thr
225                 230                 235                 240

Arg Cys Gly Ser Ile Asp Pro Ala Ile Val Pro Phe Leu Met Glu Lys
                245                 250                 255
```

Glu Gly Leu Thr Thr Arg Glu Ile Asp Thr Leu Met Asn Lys Lys Ser
260 265 270

Gly Val Leu Gly Val Ser Gly Leu Ser Asn Asp Phe Arg Asp Leu Asp
275 280 285

Glu Ala Ala Ser Lys Gly Asn Arg Lys Ala Glu Leu Ala Leu Glu Ile
290 295 300

Phe Ala Tyr Lys Val Lys Lys Phe Ile Gly Glu Tyr Ser Ala Val Leu
305 310 315 320

Asn Gly Ala Asp Ala Val Val Phe Thr Ala Gly Ile Gly Glu Asn Ser
325 330 335

Ala Ser Ile Arg Lys Arg Ile Leu Thr Gly Leu Asp Gly Ile Gly Ile
340 345 350

Lys Ile Asp Asp Glu Lys Asn Lys Ile Arg Gly Gln Glu Ile Asp Ile
355 360 365

Ser Thr Pro Asp Ala Lys Val Arg Val Phe Val Ile Pro Thr Asn Glu
370 375 380

Glu Leu Ala Ile Ala Arg Glu Thr Lys Glu Ile Val Glu Thr Glu Val
385 390 395 400

Lys Leu Arg Ser Ser Ile Pro Val
405

<210> 26

<211> 585

<212> DNA

<213> Sulfolobus acidocaldarius

<400> 26
atgaagattg gtattgtaac tggaattcct ggtgtaggga aaagtactgt cttggctaaa 60

gttaaagaga tattggataa tcaaggtata aataacaaga tcataaatta tggagatttt 120

atgttagcaa cagcattaaa attaggctat gctaaagata gagacgaaat gagaaaatta 180

tctgtagaaa agcagaagaa attgcagatt gatgcggcta aaggtatagc tgaagaggca 240

agagcaggtg gagaaggata tctgttcata gatacgcatg ctgtgatacg tacacctct 300

ggatatttac ctggtttacc gtcatatgta attacagaaa taaatccgtc tgttatcttt 360

ttactggaag ctgatcctaa gataatatta tcaaggcaaa agagagatac aacaaggaat 420

agaaatgatt atagtgacga atcagttata ttagaaacca taaacttcgc tagatatgca 480

gctactgctt ctgcagtatt agccggttct actgttaagg taattgtaaa cgtggaagga 540

gatcctagta tagcagctaa tgagataata aggtctatga agtaa 585

<210> 27

<211> 585

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetic

<400> 27
atgaaaatcg gtatcgttac cggtatcccg ggtgttggta aatctaccgt tctggctaaa 60

gttaaagaaa tcctggacaa ccagggtatc aacaacaaaa tcatcaacta cggtgacttc 120

atgctggcta ccgctctgaa actgggttac gctaaagacc gtgacgaaat gcgtaaactg 180

tctgttgaaa aacagaaaaa actgcagatc gacgctgcta aaggtatcgc tgaagaagct 240

cgtgctggtg gtgaaggtta cctgttcatc gacacccacg ctgttatccg taccccgtct 300

ggttacctgc cgggtctgcc gtcttacgtt atcaccgaaa tcaacccgtc tgttatcttc 360

ctgctggaag ctgacccgaa aatcatcctg tctcgtcaga aacgtgacac cacccgtaac 420

cgtaacgact actctgacga atctgttatc ctggaaacca tcaacttcgc tcgttacgct 480

gctaccgctt ctgctgttct ggctggttct accgttaaag ttatcgttaa cgttgaaggt 540

gacccgtcta tcgctgctaa cgaaatcatc cgttctatga aatag 585

<210> 28

<211> 663

<212> DNA

<213> Thermotoga maritima

<400> 28
atgatggcgt accttgtctt tctaggacct ccaggtgcag gaaaaggaac ctacgcaaag 60

agattgcagg aaataacggg gattcctcat atatccaccg gtgacatttt cagggacatt 120

gtaaaaaaag agaacgacga gcttgggaaa aagataaaag agatcatgga aaggggagaa 180

ctcgttccgg acgaactcgt gaacgaggtt gtgaaaagaa gactctcaga aaaagattgt 240

gaaagaggat tcatactgga cggctatcca agaaccgttg ctcaggcgga attcctcgac 300

ggcttttga aaactcaaaa caaagagctc acggctgctg tactctttga agttcctgag 360

gaagtggtcg ttcagaggct cacggccaga aggatctgcc cgaaatgtgg aagaatttac 420

aatttgattt cgctccctcc aaaagaagac gaactgtgcg atgattgtaa agtgaagctc 480

gttcagagag aagacgacaa agaagaaaca gtgagacaca gatacaaggt ttatctcgaa 540

aagacacagc cagtgattga ttactacgat aaaaagggca ttctcaaacg agtggatggt 600

accataggaa tagacaacgt gatcgctgaa gtgttaaaga taatagggtg gagtgataaa 660

tga 663

<210> 29

<211> 660

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetic

<400> 29

atgatggcct atctggtttt tcttggtcca ccgggggcag gcaaaggtac atatgcgaaa 60

cgtttacagg aaatcaccgg catcccgcac attagcacgg gcgacatttt tcgtgatatt 120

gtcaaaaagg aaaatgacga attaggtaag aaaattaaag aaattatgga gcgcggcgag 180

ttggtgccgg acgaactggt gaatgaagtt gtcaaacgtc ggctgtctga aaaggattgc 240

gaacgtggct ttattttgga cggttacccg cgtacagtag ctcaggcaga gtttctcgac 300

ggcttcctga agactcagaa taaggagtta acggctgcgg tcctgttcga ggtgcctgaa 360

gaggtggtcg ttcagcgtct gaccgcgcgg cgtatctgcc cgaagtgtgg tcgtatttac 420

aacctgattt cacttcctcc aaaagaagat gaactgtgtg atgactgcaa agtaaaactg 480

gtgcaacgcg aagatgataa agaggaaact gtgcgccatc gctacaaagt atatctggaa 540

aaaacccaac cggttatcga ttattatgat aaaaaaggca ttttgaaacg cgttgatggg 600

accatcggca tcgataacgt gattgccgaa gttctcaaaa tcattgggtg gagtgataaa 660

<210> 30

<211> 651

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetic

<400> 30
atgaacctga ttttcctggg tccgcctggg gcaggcaaag gcacccaggc gaaacgtgtg 60

tctgaaaagt acggtatccc gcagattagt accggcgata tgctgcgtga agcggttgct 120

aagggtacgg aactggggaa aaaggcgaaa gaatatatgg acaaagggga acttgttccg 180

gatgaagtag ttattggaat cgtgaaagaa cgcctccagc aaccggattg tgagaagggc 240

tttattctgg acggttttcc gcgtacgtta gcacaagccg aagctctgga cgaaatgtta 300

aaagaattga ataagaaaat tgacgccgta atcaacgtgg tcgtaccgga agaggaagtt 360

gtcaagcgta ttacctatcg tcgcacttgc cgcaattgcg gcgccgtgta ccatctcatt 420

tatgcacctc caaaagagga taataaatgt gataaatgcg gcggtgagct ttatcagcgt 480

gatgacgata aagaagagac agtccgcgag cgttaccgtg tgtataaaca gaacacagag 540

ccattgatcg attattaccg taaaaaggga atcctgtatg atgtggatgg tactaaagac 600

atcgaaggag tttggaaaga aattgaggcg attctggaaa aaattaaaag c 651